100 CONCEPTUAL MCQS: SOFTWARE ARCHITECTURE & DESIGN

Module 0: Introduction to SDLC

1. **The "Software Crisis" of the 1960s was primarily characterized by:**
    - A) Hardware becoming too expensive
    - B) Software projects exceeding budget and time estimates
    - C) Lack of programming languages
    - D) Too many software developers
    - **Answer: B**

2. **Which of the following best describes the "Management Myth" in software engineering?**
    - A) "We can add more people to a late project to catch up."
    - B) "If we have standards, our people know everything they need."
    - C) "Software is flexible, so we can change it easily."
    - D) "The only deliverable is the working program."
    - **Answer: B**

3. **In the Waterfall model, "Blocking" refers to:**
    - A) A bug preventing compilation
    - B) A team member waiting for a previous phase to complete before starting work
    - C) A security feature
    - D) The end of the project
    - **Answer: B**

4. **Why is the Spiral Model considered "Risk-Driven"?**
    - A) Because it is risky to use
    - B) Because it ignores risks until the end
    - C) Because every iteration begins with a dedicated risk analysis phase
    - D) Because it is only used for low-risk projects
    - **Answer: C**

5. **Which SDLC model would you choose for a startup building a new social media app with unclear requirements?**

- A) Waterfall
- B) V-Model
- C) Agile (Scrum)
- D) Spiral
- **Answer: C**

6. **The "V" in V-Model stands for:**

   - A) Velocity
   - B) Verification and Validation
   - C) Versioning
   - D) Virtualization
   - **Answer: B**

7. **What is the primary output of the Requirement Analysis phase?**

   - A) Source Code
   - B) Design Document Specification (DDS)
   - C) Software Requirement Specification (SRS)
   - D) Test Plan
   - **Answer: C**

8. **"Corrective Maintenance" involves:**

   - A) Adding new features
   - B) Porting to a new OS
   - C) Fixing bugs discovered after deployment
   - D) Improving performance
   - **Answer: C**

9. **Which of the following is NOT a value of the Agile Manifesto?**

   - A) Working software over comprehensive documentation
   - B) Contract negotiation over customer collaboration
   - C) Responding to change over following a plan
   - D) Individuals and interactions over processes and tools
   - **Answer: B**

10. **In Scrum, the "Daily Standup" is strictly time-boxed to:**

    - A) 1 hour
    - B) 30 minutes
    - C) 15 minutes
    - D) 5 minutes
    - **Answer: C**

11. **The "Feasibility Study" primarily assesses:**

    - A) How the UI should look
    - B) Whether the project is technically, operationally, and economically viable
    - C) Which programming language to use
    - D) Who will test the software
    - **Answer: B**

12. **Which model allows for "overlapping phases"?**

    - A) Pure Waterfall
    - B) Incremental Model
    - C) V-Model
    - D) None of the above
    - **Answer: B**

13. **"Validation" answers the question:**

    - A) "Are we building the product right?"
    - B) "Are we building the right product?"
    - C) "Is the code clean?"
    - D) "Is the design efficient?"
    - **Answer: B**

14. **"Verification" answers the question:**

    - A) "Are we building the product right?"
    - B) "Are we building the right product?"
    - C) "Will the user like it?"
    - D) "Is it profitable?"
    - **Answer: A**

15. **The primary disadvantage of the Iterative Model is:**

    - A) It takes too long to see a working product
    - B) It requires rigorous planning of the entire system at the start
    - C) System architecture issues may arise because not all requirements are gathered upfront
    - D) It is not suitable for large teams
    - **Answer: C**

Module 1: Foundations of Design & Architecture

16. **If a module performs one single, well-defined task, it has:**

- A) Low Cohesion
- B) High Cohesion
- C) High Coupling
- D) Logical Cohesion
- **Answer: B**

17. **Which type of coupling is considered the worst?**

- A) Data Coupling
- B) Control Coupling
- C) Content Coupling
- D) Stamp Coupling
- **Answer: C**

18. **The "Open/Closed Principle" suggests that:**

- A) Code should be open to bugs but closed to fixes
- B) Classes should be open for extension but closed for modification
- C) Source code should be open source
- D) Database connections should be closed immediately
- **Answer: B**

19. **A class `ReportGenerator` that formats a report AND saves it to a file violates:**

- A) Single Responsibility Principle (SRP)
- B) Open/Closed Principle (OCP)
- C) Liskov Substitution Principle (LSP)
- D) Interface Segregation Principle (ISP)
- **Answer: A**

20. **Dependency Injection is a technique to achieve:**

- A) High Coupling
- B) Dependency Inversion Principle (DIP)
- C) Interface Segregation
- D) Multiple Inheritance
- **Answer: B**

21. **"Information Hiding" is most closely related to:**

- A) Inheritance
- B) Abstraction
- C) Polymorphism
- D) Recursion
- **Answer: B**

22. **Which GRASP pattern answers: "Who is responsible for creating a new instance of some class?"**

- A) Controller
- B) Creator
- C) Expert
- D) Factory
- **Answer: B**

23. **If `Class A` uses `Class B` by passing a boolean flag to control `Class B`'s logic, this is:**

- A) Data Coupling
- B) Control Coupling
- C) Content Coupling
- D) No Coupling
- **Answer: B**

24. **The "Liskov Substitution Principle" ensures that:**

- A) Derived classes can replace base classes without altering correctness
- B) Interfaces are small and specific
- C) Dependencies are injected
- D) Classes are final
- **Answer: A**

25. **"Logical Cohesion" is when:**

- A) Elements are related by timing (e.g., initialization)
- B) Elements are logically related (e.g., all input routines) but functionally distinct
- C) Elements operate on the same data
- D) Elements are executed sequentially
- **Answer: B**

26. **Which is NOT a benefit of Modularity?**

- A) Reusability
- B) Maintainability
- C) Increased Complexity
- D) Parallel Development
- **Answer: C**

27. **The "Information Expert" pattern assigns responsibility to:**

- A) The class with the most methods
- B) The class that has the data required to fulfill the responsibility
- C) The database

- D) The user interface
- **Answer: B**

28. **"Interface Segregation Principle" advocates for:**

- A) One large "God" interface
- B) Many client-specific interfaces
- C) No interfaces at all
- D) Private interfaces only
- **Answer: B**

29. **Software Architecture is primarily concerned with:**

- A) Algorithms and data structures
- B) Non-functional requirements and high-level structure
- C) UI color schemes
- D) Variable naming conventions
- **Answer: B**

30. **Which design issue deals with the system's ability to handle increased load?**

- A) Security
- B) Scalability
- C) Usability
- D) Portability
- **Answer: B**

Module 2: Modeling & OOD

31. **In a Class Diagram, a static method is typically denoted by:**

- A) Italics
- B) Underlining
- C) Bold text
- D) A specific icon
- **Answer: B**

32. **Which relationship implies "ownership" where the child cannot exist without the parent?**

- A) Aggregation
- B) Association
- C) Composition
- D) Dependency

- **Answer: C**

33. **In a Sequence Diagram, an "Activation Bar" represents:**

- A) The time an object is waiting for a response
- B) The time an object is performing an action
- C) The object's creation
- D) The object's destruction
- **Answer: B**

34. **A "Guard Condition" in a State Machine Diagram:**

- A) Protects the state from being deleted
- B) Must be true for a transition to occur
- C) Is an error state
- D) Is a type of event
- **Answer: B**

35. **"Polymorphism" allows:**

- A) A class to have multiple parents
- B) Objects of different classes to be treated as objects of a common superclass
- C) Data to be hidden
- D) Code to be compiled faster
- **Answer: B**

36. **Which visibility modifier allows access only to subclasses and the class itself?**

- A) Public (+)
- B) Private (-)
- C) Protected (#)
- D) Package (~)
- **Answer: C**

37. **The "Diamond Problem" is a complication associated with:**

- A) Single Inheritance
- B) Multiple Inheritance
- C) Interface Implementation
- D) Composition
- **Answer: B**

38. **In UML, a dashed arrow with a hollow triangle head represents:**

- A) Inheritance (Generalization)
- B) Realization (Interface Implementation)

- C) Dependency
- D) Association
- **Answer: B**

39. **Which diagram would you use to show the workflow of a business process?**

- A) Class Diagram
- B) Activity Diagram
- C) Component Diagram
- D) Deployment Diagram
- **Answer: B**

40. **"Composition over Inheritance" is preferred because:**

- A) It allows for dynamic behavior change at runtime and reduces coupling
- B) Inheritance is not supported in modern languages
- C) Composition is faster to execute
- D) Inheritance uses more memory
- **Answer: A**

41. **An "Abstract Class":**

- A) Can be instantiated directly
- B) Cannot be instantiated and may contain abstract methods
- C) Must contain only abstract methods
- D) Is the same as an Interface
- **Answer: B**

42. **In a Use Case Diagram, "Extend" relationship implies:**

- A) Mandatory behavior
- B) Optional behavior
- C) Inheritance
- D) Inclusion
- **Answer: B**

43. **"Multiplicity" in a Class Diagram defines:**

- A) How many classes are in the diagram
- B) How many instances of one class relate to a single instance of another
- C) The number of methods in a class
- D) The depth of inheritance
- **Answer: B**

44. **Which is NOT a structural diagram?**

- A) Class Diagram
- B) Object Diagram
- C) Sequence Diagram
- D) Component Diagram
- **Answer: C**

45. **Model-Driven Architecture (MDA) separates:**

- A) Data from Logic
- B) Business logic from Platform implementation
- C) UI from Database
- D) Testing from Development
- **Answer: B**

Module 3: Architectural Styles & Patterns

46. **The "Sinkhole" anti-pattern in Layered Architecture refers to:**

- A) A database crash
- B) Layers that pass requests through without adding any value
- C) Memory leaks
- D) Security vulnerabilities
- **Answer: B**

47. **Which architecture is most vulnerable to a "Single Point of Failure"?**

- A) Peer-to-Peer
- B) Client-Server (Centralized)
- C) Microservices
- D) Event-Driven
- **Answer: B**

48. **In MVC, if the View updates automatically when the Model changes, which pattern is likely used?**

- A) Strategy
- B) Observer
- C) Factory
- D) Adapter
- **Answer: B**

49. **The main benefit of Microservices over Monolithic architecture is:**

- A) Simplicity of deployment
- B) Independent scaling and technology flexibility
- C) Lower network latency
- D) Easier transaction management
- **Answer: B**

50. **Which pattern translates one interface for a class into a compatible interface?**

- A) Facade
- B) Adapter
- C) Bridge
- D) Proxy
- **Answer: B**

51. **"Singleton" pattern is classified as:**

- A) Creational
- B) Structural
- C) Behavioral
- D) Architectural
- **Answer: A**

52. **Which tactic improves "Security"?**

- A) Load Balancing
- B) Authentication
- C) Caching
- D) Heartbeat
- **Answer: B**

53. **"Strategy" pattern allows you to:**

- A) Create only one instance of a class
- B) Select an algorithm at runtime
- C) Notify observers of changes
- D) Adapt an interface
- **Answer: B**

54. **In the "Facade" pattern:**

- A) A complex subsystem is hidden behind a simple interface
- B) An object is created
- C) Algorithms are swapped
- D) Objects are notified
- **Answer: A**

55. **Which is a "Quality Attribute"?**

- A) The system must calculate tax
- B) The system must be written in Java
- C) The system must respond within 2 seconds (Performance)
- D) The system must have a login button
- **Answer: C**

56. **"Heartbeat" is a tactic for:**

- A) Performance
- B) Availability
- C) Usability
- D) Security
- **Answer: B**

57. **Which architecture is best for a file-sharing network like BitTorrent?**

- A) Client-Server
- B) Layered
- C) Peer-to-Peer
- D) MVC
- **Answer: C**

58. **In MVP (Model-View-Presenter), the View is:**

- A) Active (observes Model)
- B) Passive (updated by Presenter)
- C) The same as Controller
- D) Non-existent
- **Answer: B**

59. **"Load Balancing" primarily improves:**

- A) Security
- B) Scalability and Availability
- C) Usability
- D) Maintainability
- **Answer: B**

60. **Which pattern defines a family of algorithms, encapsulates each one, and makes them interchangeable?**

- A) Strategy
- B) State
- C) Template Method

- D) Command
- **Answer: A**

Module 4: Specialized Design Layers

61. **"Affordance" in UI design refers to:**

    - A) The cost of the software
    - B) Visual clues that suggest how an object should be used (e.g., a button looks clickable)
    - C) The color scheme
    - D) The font size
    - **Answer: B**

62. **Which is NOT a principle of Responsive Web Design?**

    - A) Fluid Grids
    - B) Flexible Images
    - C) Media Queries
    - D) Fixed-width Layouts
    - **Answer: D**

63. **ORM (Object-Relational Mapping) solves the problem of:**

    - A) Network latency
    - B) Impedance Mismatch between OOP and Relational DBs
    - C) UI responsiveness
    - D) Security encryption
    - **Answer: B**

64. **The "DAO Pattern" separates:**

    - A) View from Controller
    - B) Business Logic from Data Access Logic
    - C) Client from Server
    - D) HTML from CSS
    - **Answer: B**

65. **Which HTTP method is idempotent and safe for retrieving data?**

    - A) POST
    - B) GET
    - C) DELETE
    - D) PATCH

- **Answer: B**

66. **"Lazy Loading" improves performance by:**

- A) Loading all resources at once
- B) Loading resources only when they are needed
- C) Compressing images
- D) Using a CDN
- **Answer: B**

67. **A "Wireframe" is:**

- A) A high-fidelity visual design
- B) A low-fidelity structural sketch of a UI
- C) The final code
- D) A database schema
- **Answer: B**

68. **"Fitts's Law" in UI/UX predicts:**

- A) The time required to move to a target area (e.g., a button)
- B) The color contrast ratio
- C) The number of clicks to reach a page
- D) The loading time of a page
- **Answer: A**

69. **Which storage mechanism is sent to the server with every HTTP request?**

- A) LocalStorage
- B) SessionStorage
- C) Cookies
- D) IndexedDB
- **Answer: C**

70. **"Sanitization" of input is primarily a defense against:**

- A) DDoS attacks
- B) XSS (Cross-Site Scripting) and SQL Injection
- C) Phishing
- D) Brute force attacks
- **Answer: B**

71. **Which is a benefit of Client-Side Rendering (CSR)?**

- A) Better SEO
- B) Faster initial load

- C) Rich, app-like interactivity (SPA feel)
- D) Lower client CPU usage
- **Answer: C**

72. **"Hick's Law" states that:**

- A) More choices increase decision time
- B) Users don't read, they scan
- C) White space is wasted space
- D) Colors affect emotion
- **Answer: A**

73. **In Database design, "Normalization" is the process of:**

- A) Creating backups
- B) Organizing data to minimize redundancy
- C) Encrypting data
- D) Adding more tables
- **Answer: B**

74. **Which is an example of a "Dark Pattern" in UI?**

- A) Clear navigation
- B) A checkbox that is pre-checked to sign up for spam
- C) Consistent color scheme
- D) Helpful error messages
- **Answer: B**

75. **JWT (JSON Web Token) is commonly used for:**

- A) Database storage
- B) Stateless Authentication
- C) Image compression
- D) CSS styling
- **Answer: B**

Module 5: Process, Implementation & Evaluation

76. **"Refactoring" means:**

- A) Rewriting the entire application
- B) Changing the internal structure of code without changing its external behavior
- C) Adding new features

- D) Fixing bugs
- **Answer: B**

77. **In TDD (Test-Driven Development), the cycle is:**

- A) Code -> Test -> Refactor
- B) Test -> Code -> Refactor (Red-Green-Refactor)
- C) Design -> Code -> Test
- D) Refactor -> Test -> Code
- **Answer: B**

78. **Which is NOT a benefit of Code Review?**

- A) Finding bugs early
- B) Knowledge sharing
- C) Enforcing coding standards
- D) Assigning blame for errors
- **Answer: D**

79. **"Technical Debt" refers to:**

- A) The cost of software licenses
- B) The implied cost of additional rework caused by choosing an easy solution now instead of a better approach
- C) The salary of developers
- D) The server hosting fees
- **Answer: B**

80. **ATAM stands for:**

- A) Automated Testing and Monitoring
- B) Architecture Trade-off Analysis Method
- C) Agile Team Assessment Method
- D) Advanced Technology Application Model
- **Answer: B**

81. **In the 4+1 View Model, the "Process View" addresses:**

- A) Concurrency, synchronization, and performance
- B) Class structure
- C) Deployment topology
- D) User requirements
- **Answer: A**

82. **"Continuous Deployment" means:**

- A) Deploying once a year
- B) Every change that passes automated tests is deployed to production automatically
- C) Deploying manually every Friday
- D) Deploying only to a staging server
- **Answer: B**

83. **Which is a "Sensitivity Point" in architecture evaluation?**

- A) A decision that has no impact
- B) A decision that is critical for achieving a specific quality attribute
- C) A bug in the code
- D) A user requirement
- **Answer: B**

84. **"Software Reuse" at the "Framework" level involves:**

- A) Copy-pasting code snippets
- B) Using a library like Math.h
- C) Using a skeleton architecture like Spring or Angular
- D) Using a design pattern
- **Answer: C**

85. **The "Bus Factor" of a project refers to:**

- A) The speed of the data bus
- B) The number of team members that can be hit by a bus before the project stalls (knowledge concentration)
- C) The cost of transportation
- D) The number of bugs
- **Answer: B**

86. **"Forward Engineering" is:**

- A) Creating models from code
- B) Creating code from design models
- C) Updating documentation
- D) Testing the software
- **Answer: B**

87. **Which is a risk of excessive Software Reuse?**

- A) Faster development
- B) "Not Invented Here" syndrome
- C) Dependency on external vendors/maintainers
- D) Higher quality

- **Answer: C**

88. **CBAM (Cost Benefit Analysis Method) adds what dimension to ATAM?**

- A) Security
- B) Economic/Financial (ROI)
- C) Performance
- D) Usability
- **Answer: B**

89. **In Scrum, who prioritizes the Product Backlog?**

- A) Scrum Master
- B) Development Team
- C) Product Owner
- D) CEO
- **Answer: C**

90. **"Burndown Chart" tracks:**

- A) The number of bugs found
- B) The amount of work remaining vs. time
- C) The budget spent
- D) The server uptime
- **Answer: B**

91. **"Pair Programming" has been shown to:**

- A) Double the development time
- B) Improve code quality and reduce bugs
- C) Increase developer isolation
- D) Reduce communication
- **Answer: B**

92. **Which is an example of "Static Analysis"?**

- A) Running the code and checking output
- B) Using a tool to check code for style and potential errors without running it (Linting)
- C) User Acceptance Testing
- D) Performance Testing
- **Answer: B**

93. **"Regression Testing" ensures that:**

- A) New features work
- B) New changes haven't broken existing functionality

- C) The system is secure
- D) The UI is beautiful
- **Answer: B**

94. **The "Deployment View" in 4+1 Model maps software to:**

- A) Hardware nodes
- B) Database tables
- C) User roles
- D) Source files
- **Answer: A**

95. **"Trade-off" in architecture means:**

- A) Getting everything for free
- B) Sacrificing one quality attribute to improve another (e.g., Security vs. Performance)
- C) Trading code with another team
- D) Selling the software
- **Answer: B**

96. **Which is a "Code Smell"?**

- A) A comment explaining complex logic
- B) A very long method (Long Method)
- C) A small class
- D) A unit test
- **Answer: B**

97. **"YAGNI" stands for:**

- A) You Are Going to Need It
- B) You Ain't Gonna Need It (Don't implement features until necessary)
- C) Yet Another Great New Idea
- D) Your App Goes Now Instant
- **Answer: B**

98. **"DRY" principle stands for:**

- A) Don't Repeat Yourself
- B) Do Repeat Yourself
- C) Data Reliability Yield
- D) Design Review Yearly
- **Answer: A**

99. **"KISS" principle stands for:**

- A) Keep It Simple, Stupid
- B) Keep It Secure, Safe
- C) Keep It Short, Sweet
- D) Know Internal System Structure
- **Answer: A**

100. **The ultimate goal of Software Engineering is to:**
    * A) Write as much code as possible
    * B) Produce high-quality software on time and within budget
    * C) Use the latest framework
    * D) Eliminate all managers
    * **Answer: B**